Simulation of PM2.5 Particulate Matter Pollution in US East Coast Using SMAT-CE Software

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Abstract

Nowadays air pollution is becoming a serious global threat to human health and environment. Particulate matter with size of 2.5 micron or less are much more harmful for health because they can be easily absorbed into deep part of the lung. In order to control PM2.5 air pollution, it is important to understand the PM2.5 pollution diffusion mechanism and find out the factors affecting its propagation. In this poster, we use SMAT-CE software by US EPA and TIBCO to simulate the PM2.5 air pollution in US east coast. The data of PM2.5 pollution levels were collected by EPA and available in its website. Through SMAT-CE simulation, we plot the heat map of PM2.5 concentrations of major cities in US east coast in the past years. Based on the data, we tried to find its relation to various weather conditions, wind and other factors. The results will be helpful to further understand the behavior of PM2.5 air pollution and suggest some possible ways to improve the air quality in the area.

Introduction

In our life, PM2.5 is one of necessary things that we need to know before we go outside. And sometimes when we try our best to reduce PM2.5 concentration through different ways, there is no significant effect. So finding the relationship between rainfall and wind is very important so that we can work effectively on reducing concentration of PM2.5.

Proposed Method

A. Draw Heat Map by using SMAT-CE

First, we upload PM2.5 concentration data of east coast in year 2011 to SMAT-CE. Draw a heat map of this data.

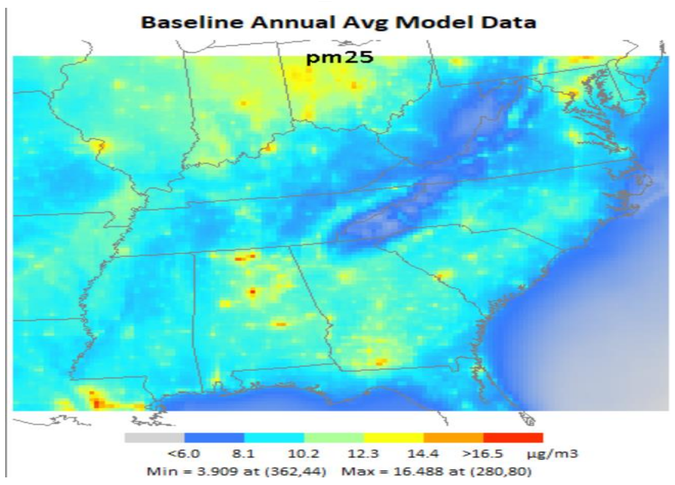

Fig.1: Heat Map of PM2.5 in East Coast

B. Draw line charts by using TIBCO

Using PM2.5 data of Fairfield, New Heaven , Hartford and New York in year 2017 from EPA to draw line charts. Q1 represents spring, Q2 represents summer, Q3 represents fall, and Q4 represents winter. Obviously, the PM2.5 is lowest at summer in these four counties.

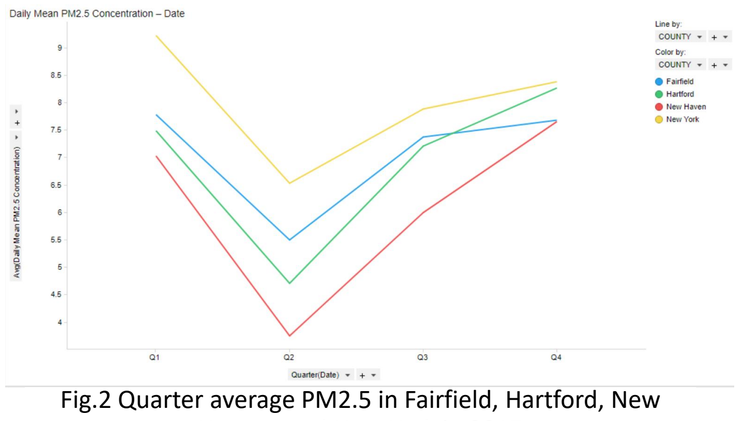

Fig.2 Quarter average PM2.5 in Fairfield, Hartford, New Heaven and New York in 2017

C. Rainfall data

Next, we compare rainfall data and temperature data of these four counties in year 2017 to PM2.5 concentration.

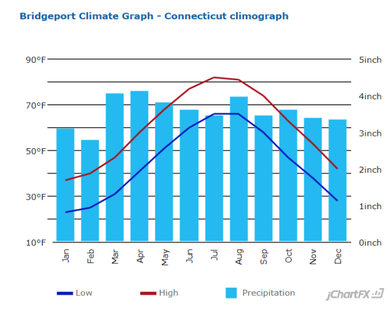

Fig.3: Temperature and Precipitation in Bridgeport

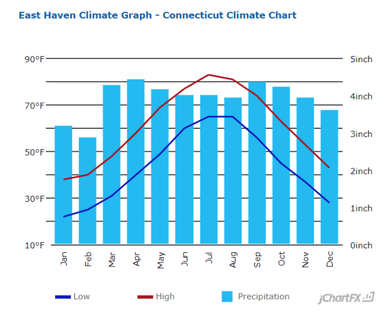

Fig.4: Temperature and Precipitation in New Heaven

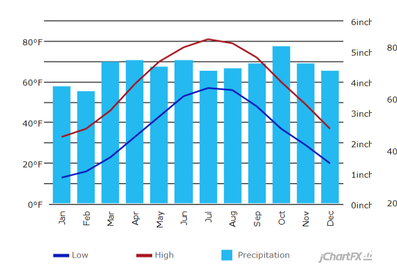

Fig.5: Temperature and Precipitation in Hartford

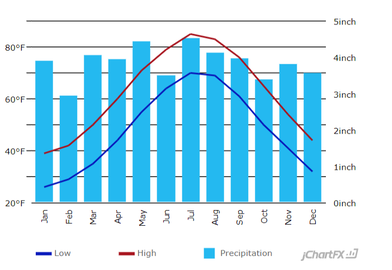

Fig.6: Temperature and Precipitation in New York

D. Wind factor

Compare wind strength and direction to PM2.5 concentration in recent days.

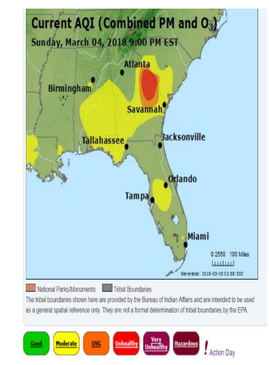

Fig.7: AQI in south east coast in March 4

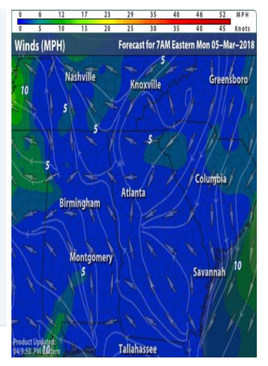

Fig.8: Wind direction and strength in south east coast

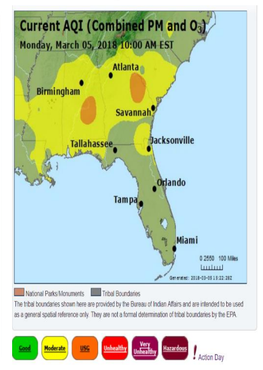

Fig.9:AQI in south east coast in March 5

Conclusion

1.From the heatmap of PM2.5 at east coast, we can see coast air quality is better than inland.

2. PM2.5 in spring is higher than summer and the main reason is that the rainfall in spring is lower than summer. And rain can reduce PM2.5 concentration.

3. Wind direction and strength can directly influence the motion of PM2.5.

Reference

[1]Fig.3,4,5,6: https://www.usclimatedata.com/

[2]Fig.8: http://www.intellicast.com/

[3]Fig.7,9: https://airnow.gov/index.cfm?action=airnow.main